



HSNU-TAIPEI

The Evengers

IGEM 2015



Food scandals in the world

The tainted
milk scandal

The horse
meat scandal

The recycled
oil scandal



The recycled oil scandal

Food
Safety

Profit-oriented
oil producers

Self-developed
low cost recycled
oil detector

People feel panic

The Kingdom of delicacy



Research Questions

- Is it possible for our self-developed low cost recycled oil detector to ensure food safety?
- What can we do to ensure food safety as a teenager?



Origin of Team Name



The Avengers

+

=



E. coli.

The Evengers





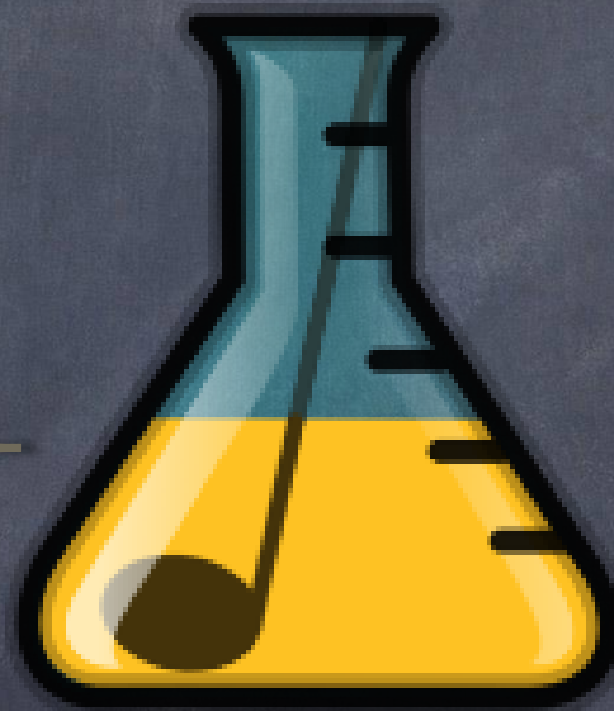
We are
The Evengers



Experiment

Treatment Group Synthetic Biology

- Benzo[a]pyrene
- Heavy metals
- Others



Control group Chemistry

- GC-MS
- Au NPs



Cooperation with Academic Institutes



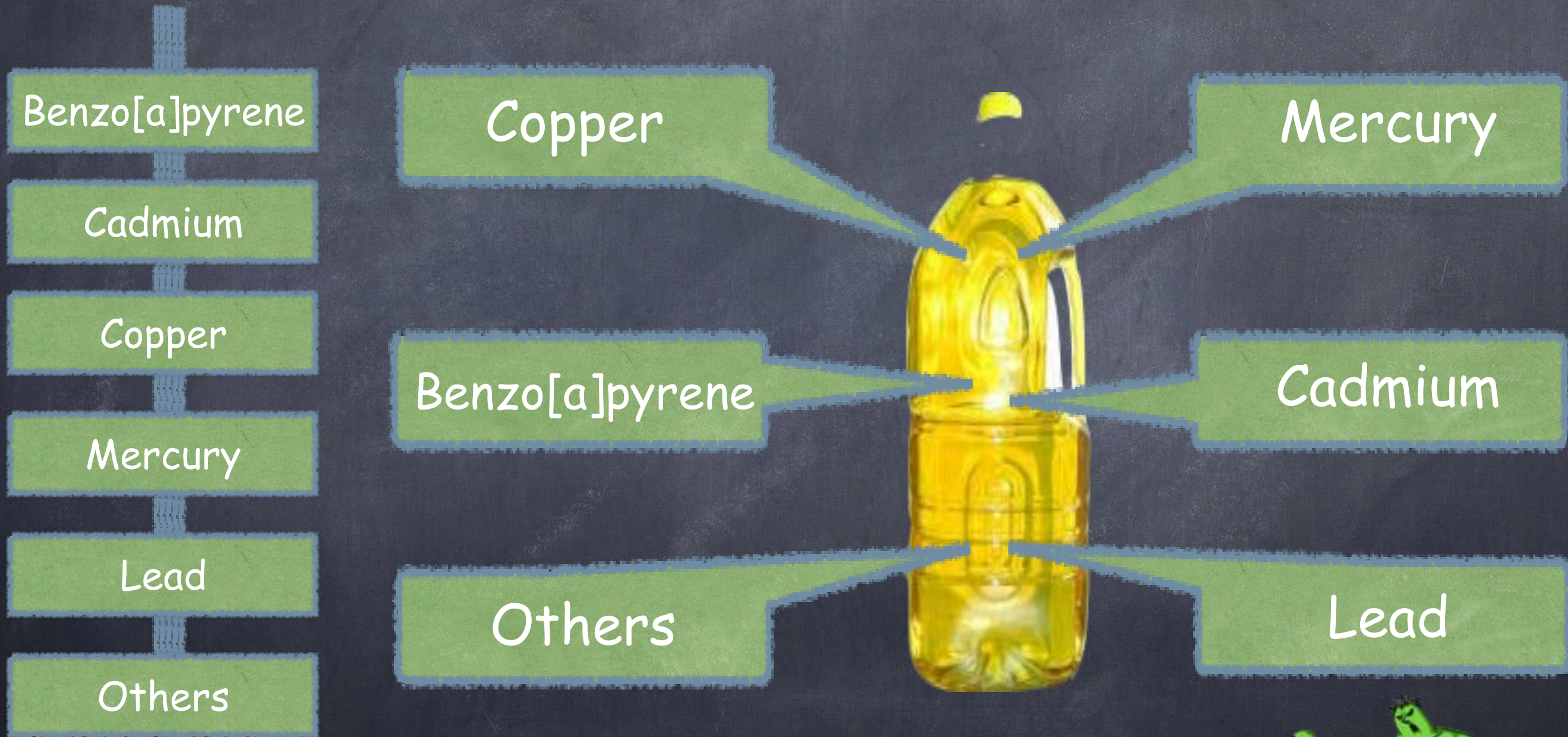
Motivation

e.g. Detecting Benzo[a]pyrene

- Expense: NT5000 (=170USD)
- Time: 2 Weeks
- Time & Money Consuming



Detecting Compounds



The production of Benzo[a]pyrene

Benzo[a]pyrene

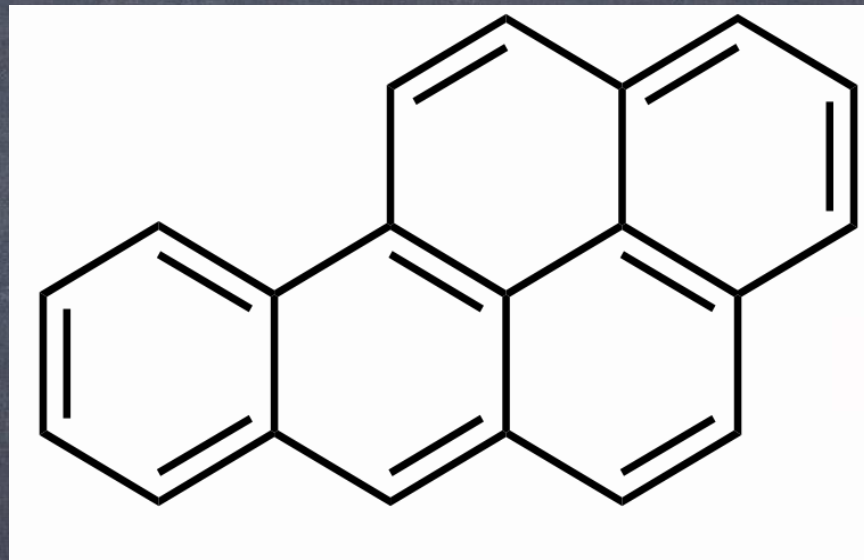
Cadmium

Copper

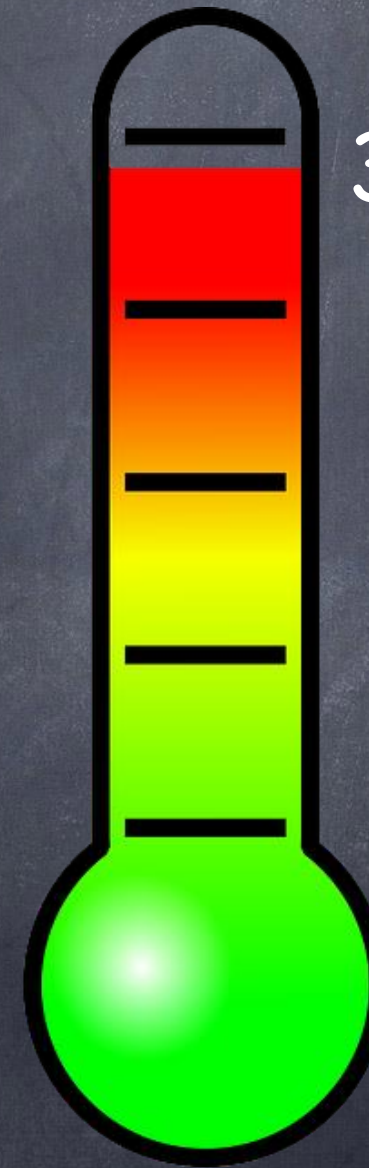
Mercury

Lead

Others



Benzo[a]pyrene



300~600°C



Benzo[a]pyrene Degradation

Benzo[a]pyrene

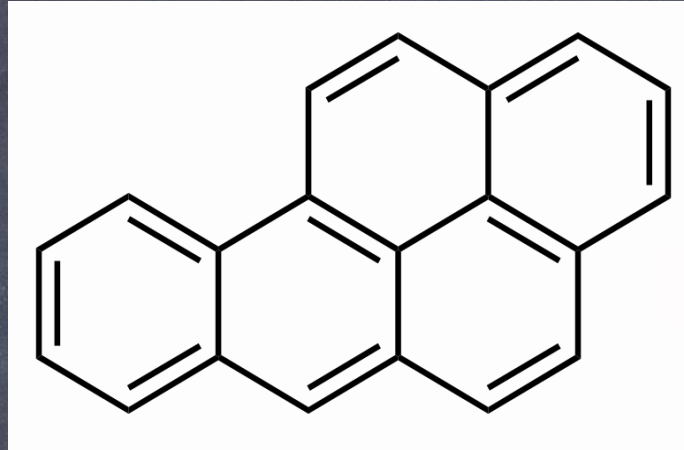
Cadmium

Copper

Mercury

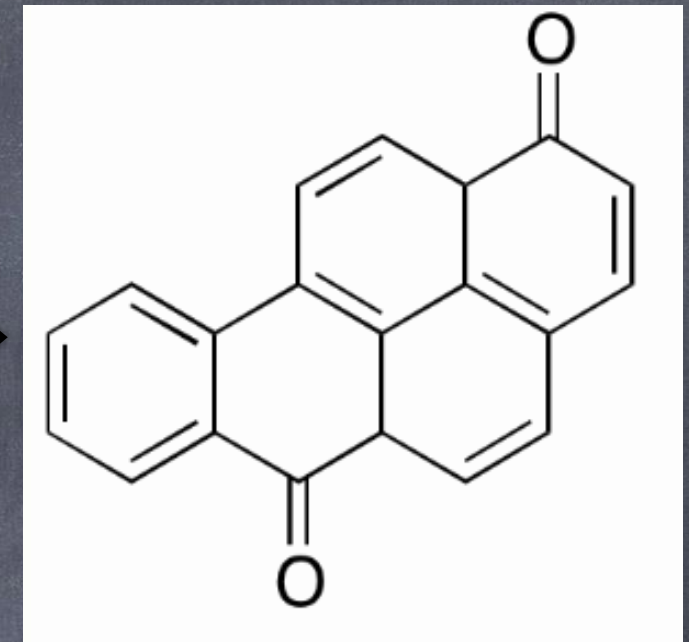
Lead

Others

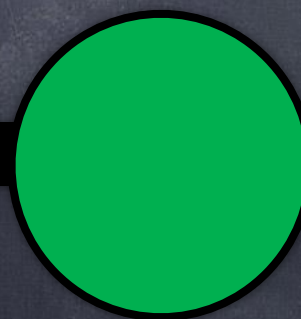
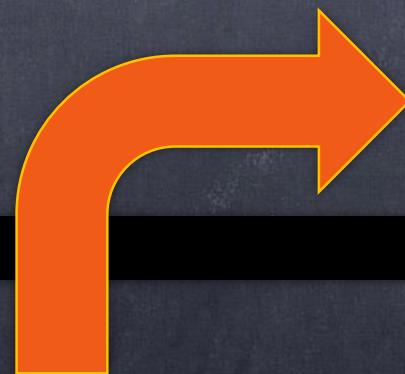


Benzo[a]pyrene

Laccase



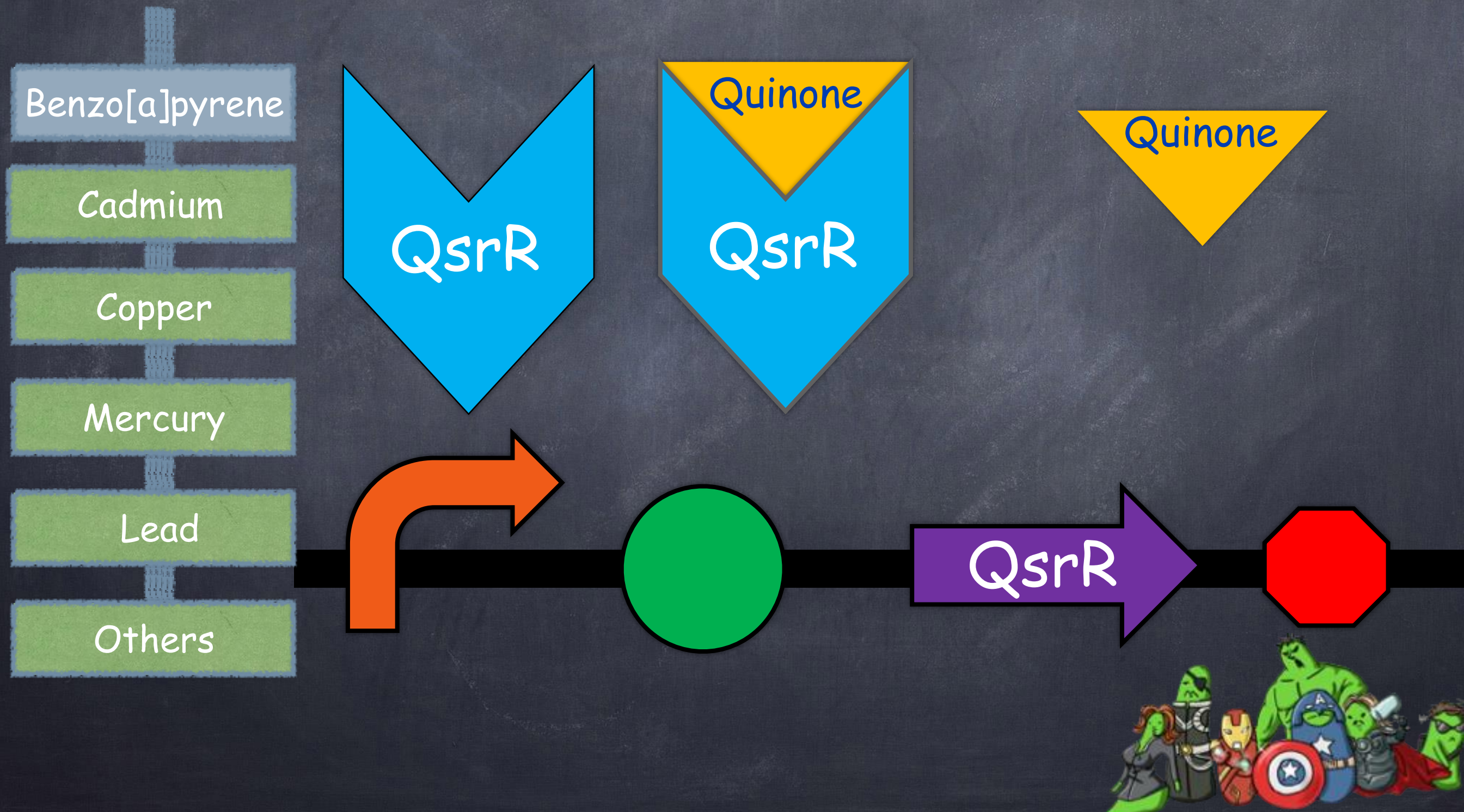
Bap-1,6-Quinone



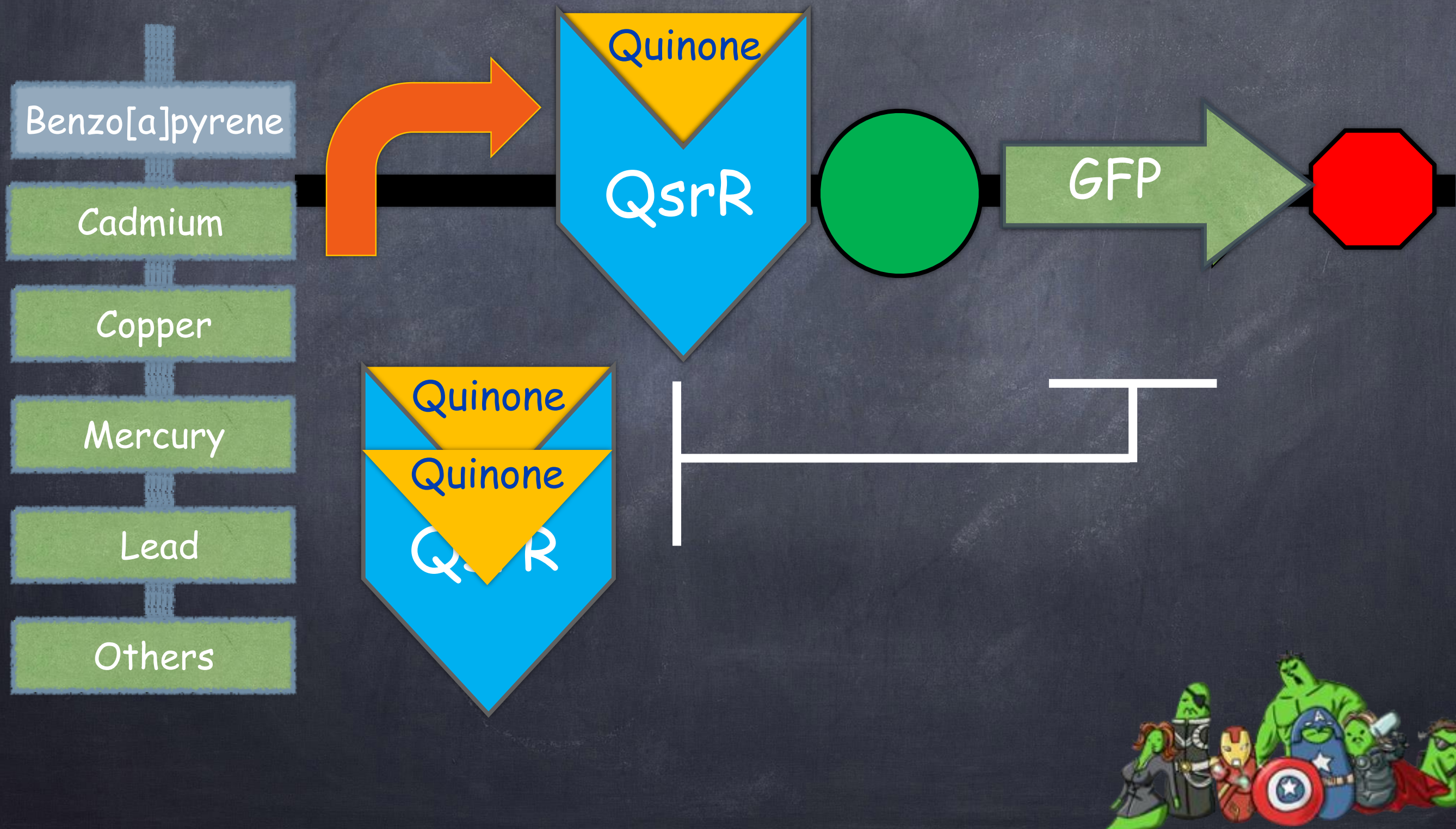
Laccase



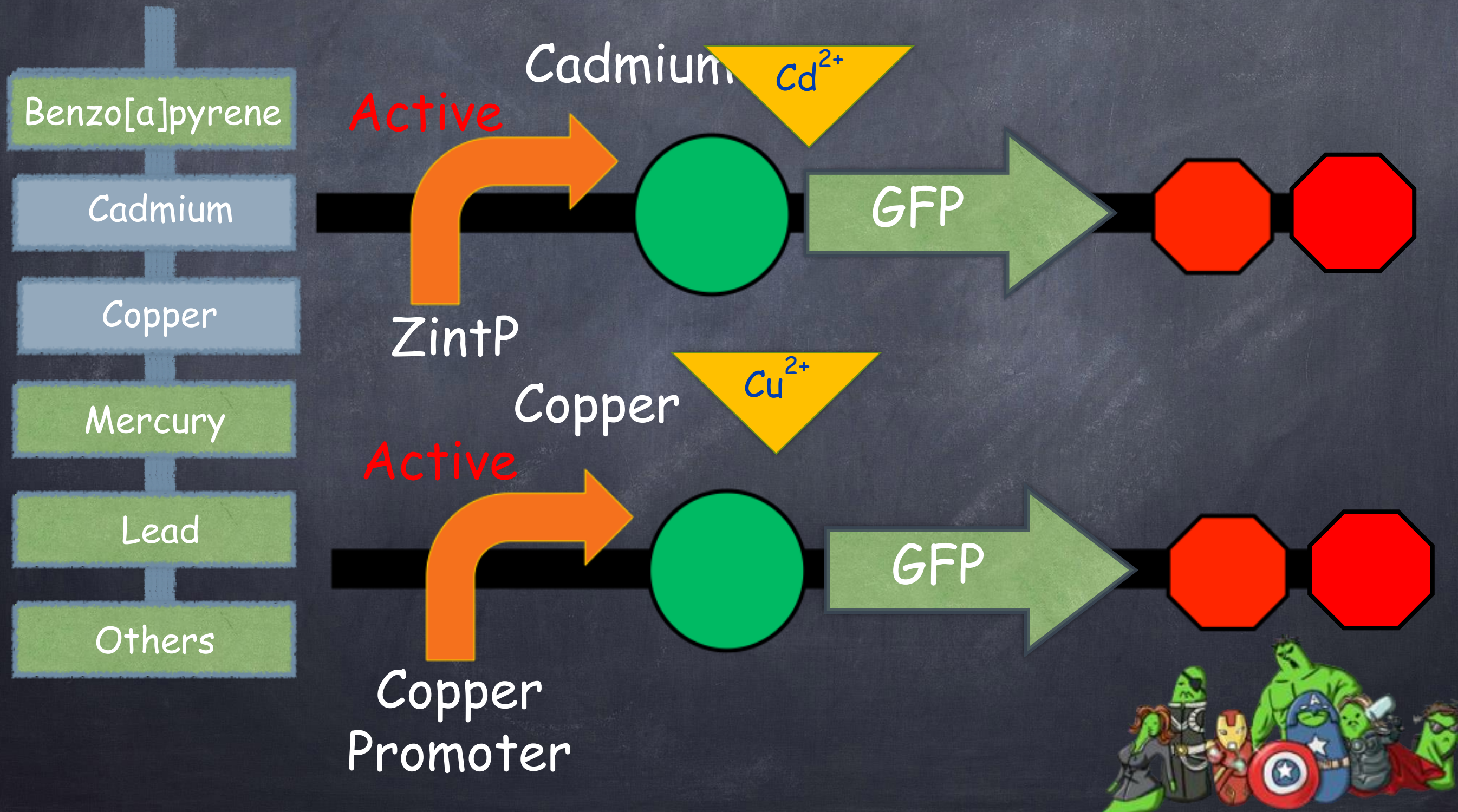
Circuit Design For Detecting Benzo[a]pyrene



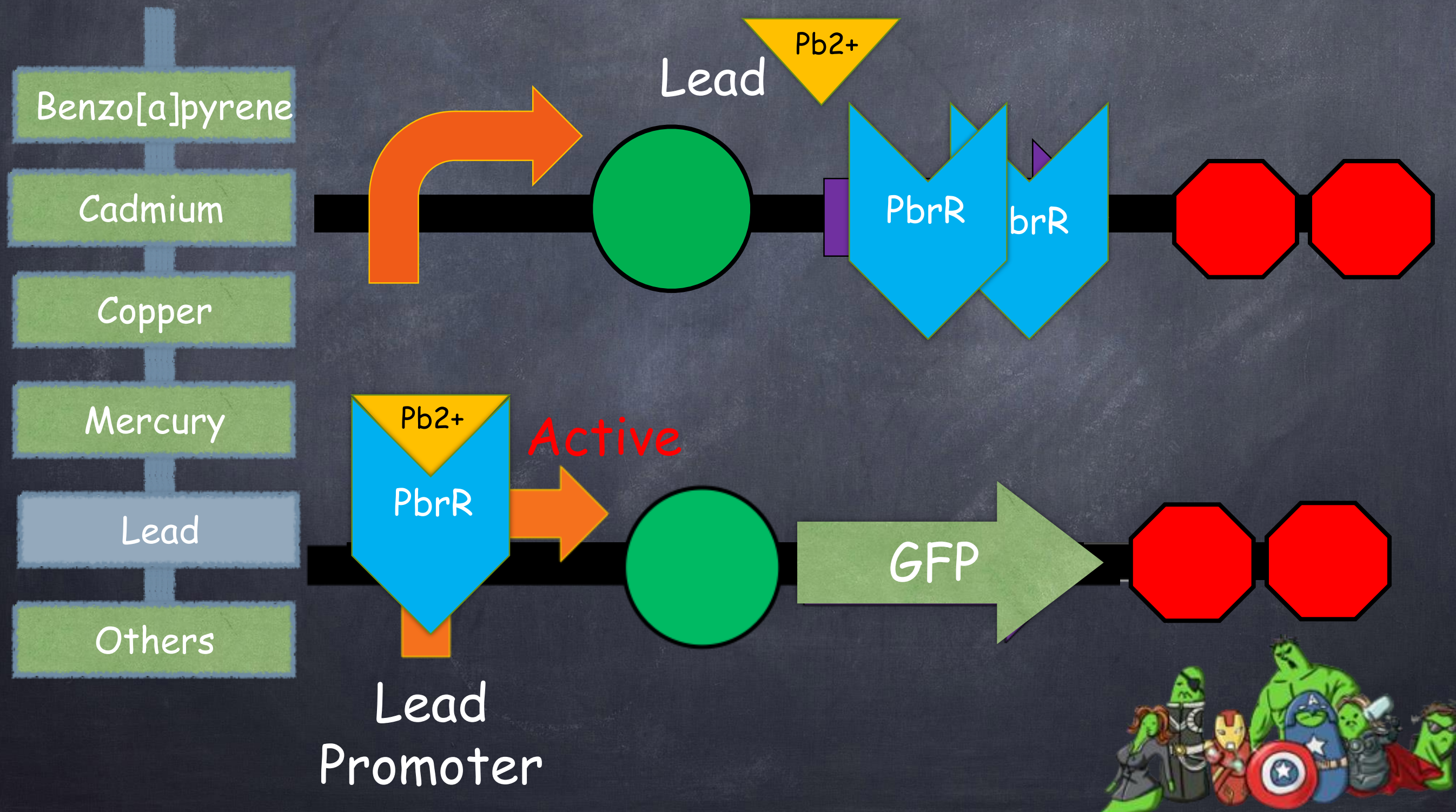
Circuit Design For Detecting Benzo[a]pyrene



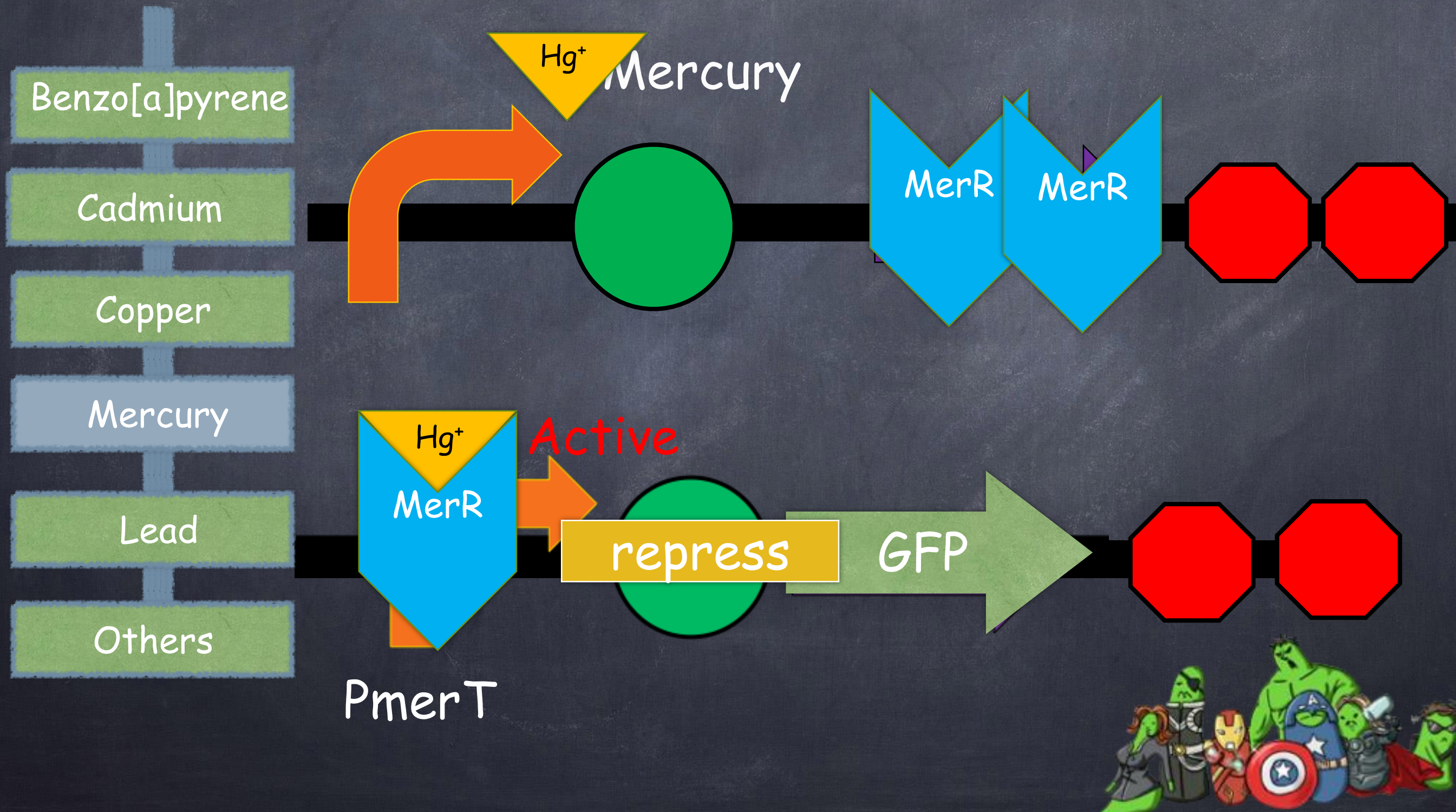
Circuit Design For Detecting Cadmium and Copper



Circuit Design For Detecting Lead



Circuit Design For Detecting Mercury



Circuit Design For Detecting Other Toxins

Chemical Method

Benzo[a]pyrene

Cadmium

Copper

Mercury

Lead

Others



Oil contain
toxins

Government
can't detect
the toxin

We can
detect
the toxin

CYP1A2



Circuit Design For Detecting Other Toxins

Benzo[a]pyrene

Cadmium

Copper

Mercury

Lead

Aflatoxin B1

What is **CYP1A2**?

- Human liver's gene
- Metabolic Drugs

e.g.

caffeine, aflatoxin B1, acetaminophen



Circuit Design For Detecting Other Toxins-Aflatoxin B1

Benzo[a]pyrene

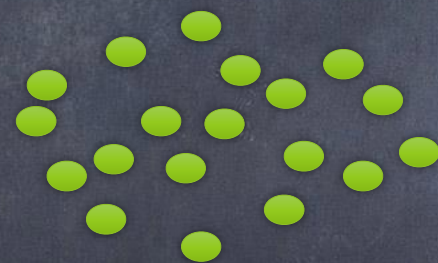
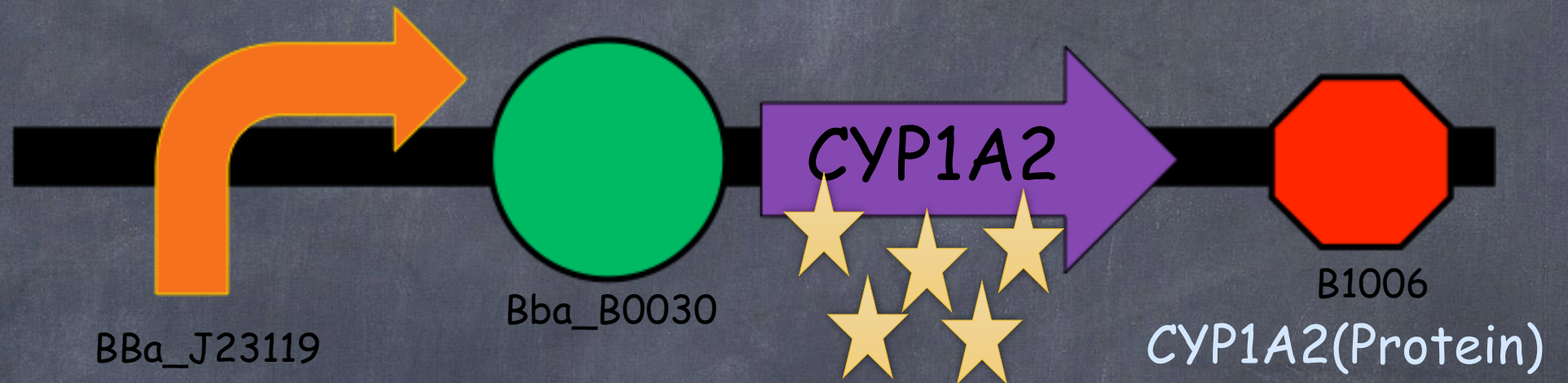
Cadmium

Copper

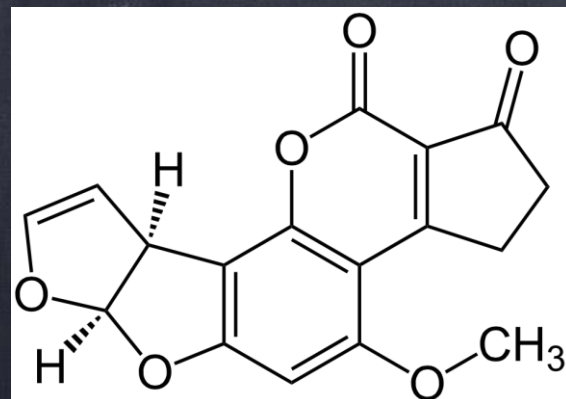
Mercury

Lead

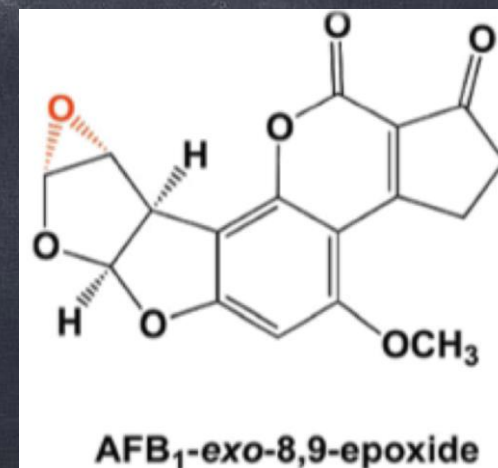
Others



AFB1



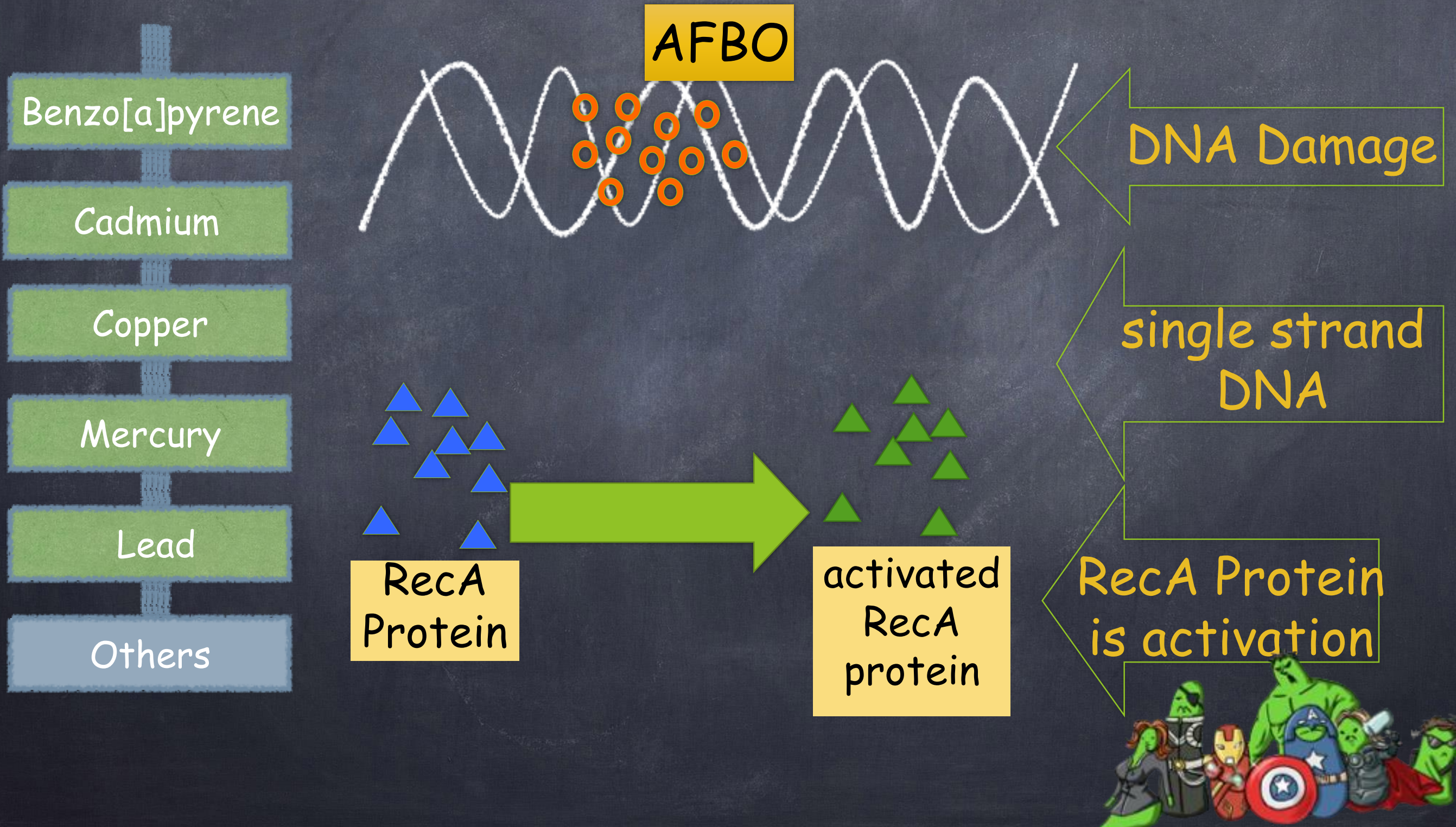
AFBO



AFB₁-exo-8,9-epoxide



Circuit Design For Detecting Other Toxins



Circuit Design For Detecting Other Toxins

Sos response system

activated
RecA protein

Benzo[a]pyrene

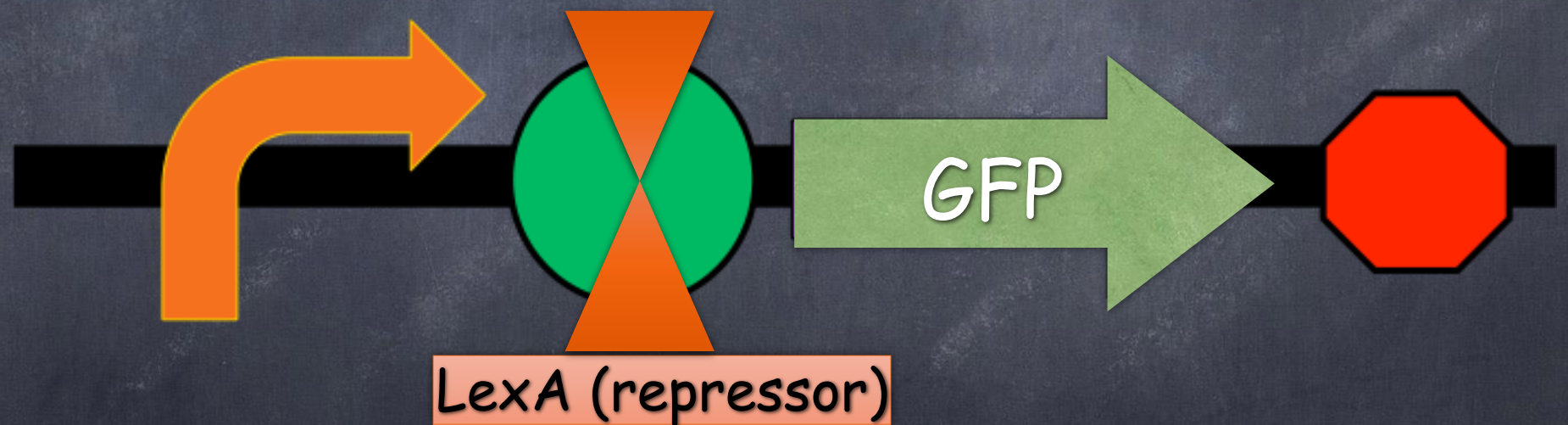
Cadmium

Copper

Mercury

Lead

Others



Chemical m evidence

Benzo[a]pyrene

2.0 ppb

Cadmium

0.05 ppm

Copper

0.5 ppm

Mercury

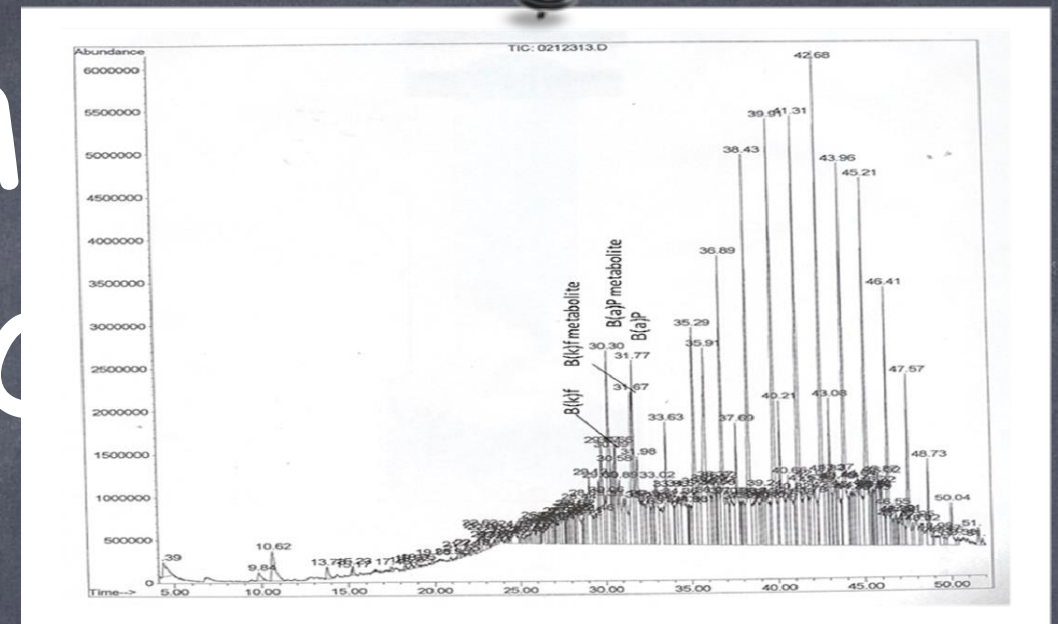
0.4 ppm

Lead

0.025 ppm

Aflatoxin B1

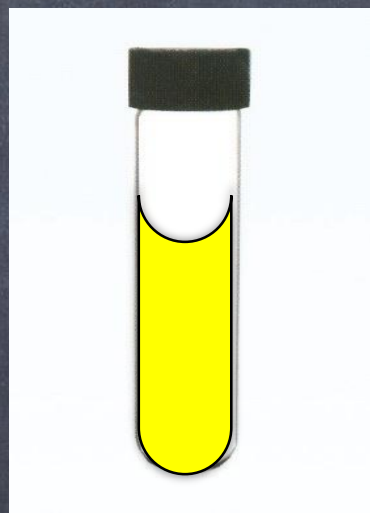
10.0 ppb



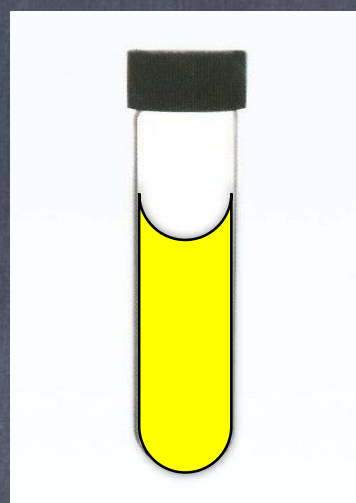
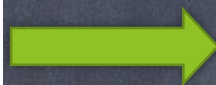
GC-MS



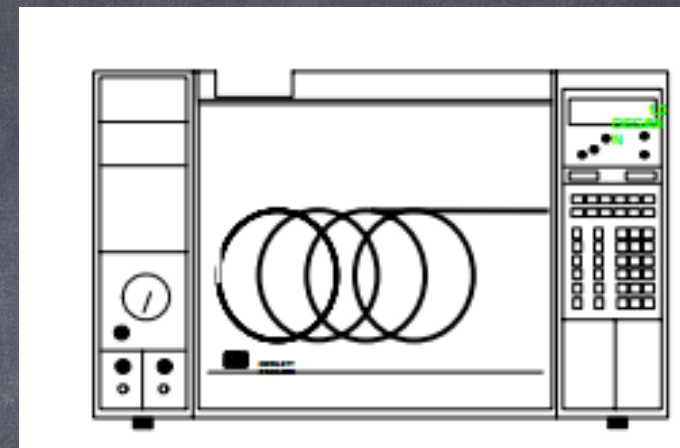
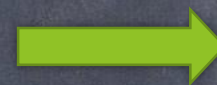
oil



CH_3CN



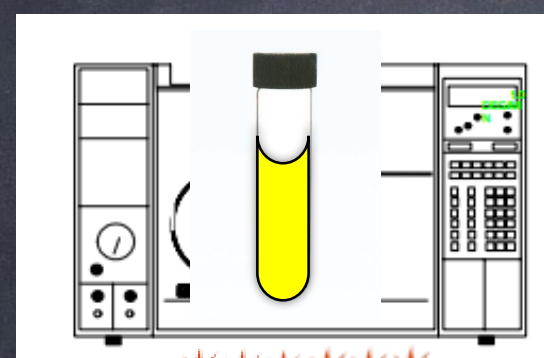
solution



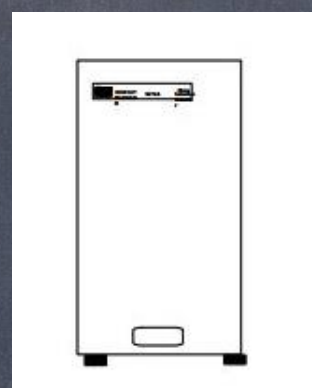
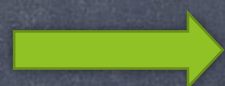
Gas Chromatograph



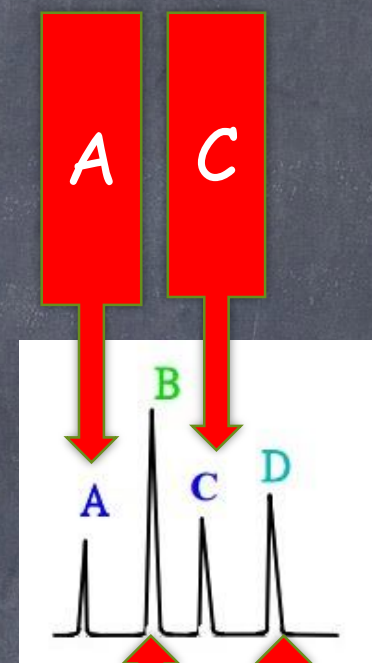
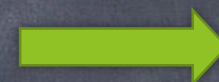
GC-MS



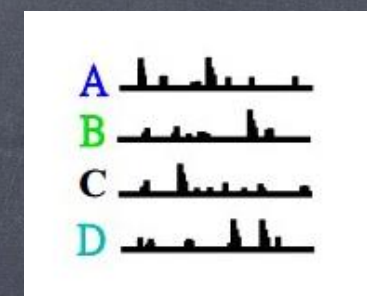
Gas
Chromatograph



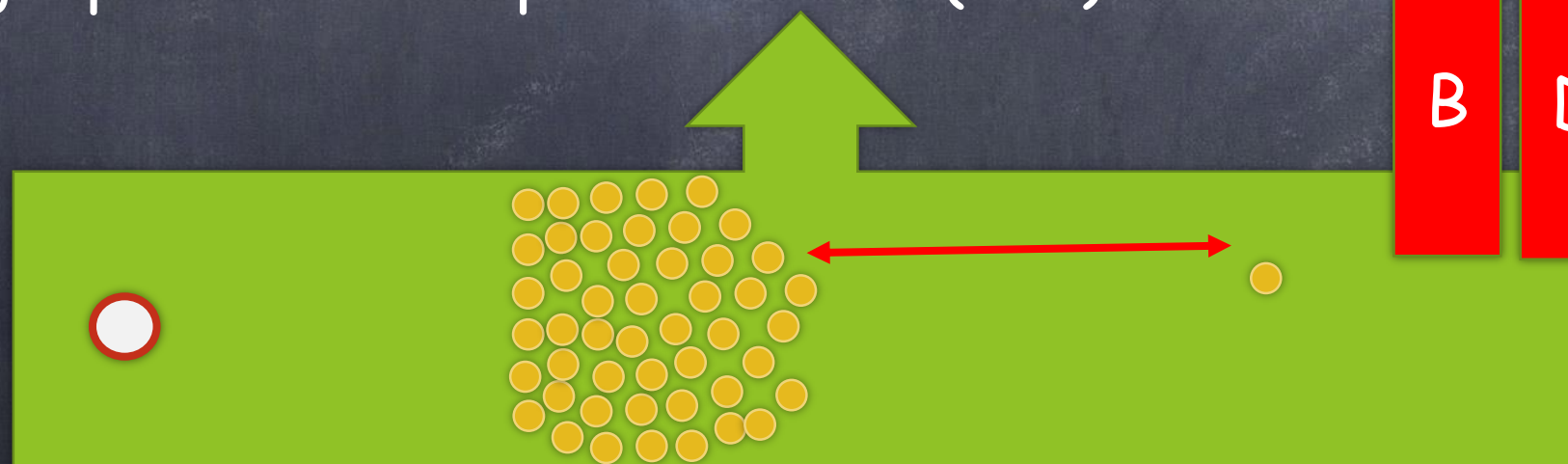
Mass
Spectrometer(MS)



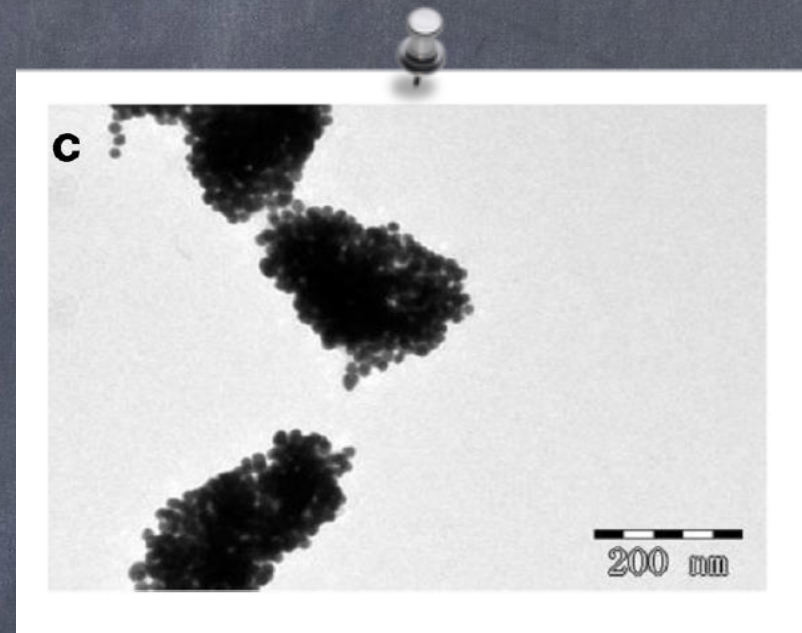
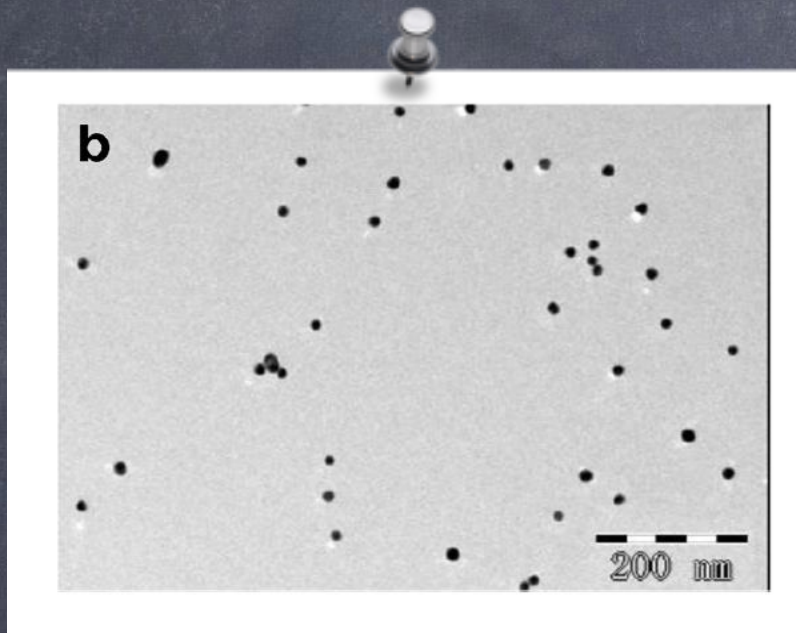
Separation



Identification

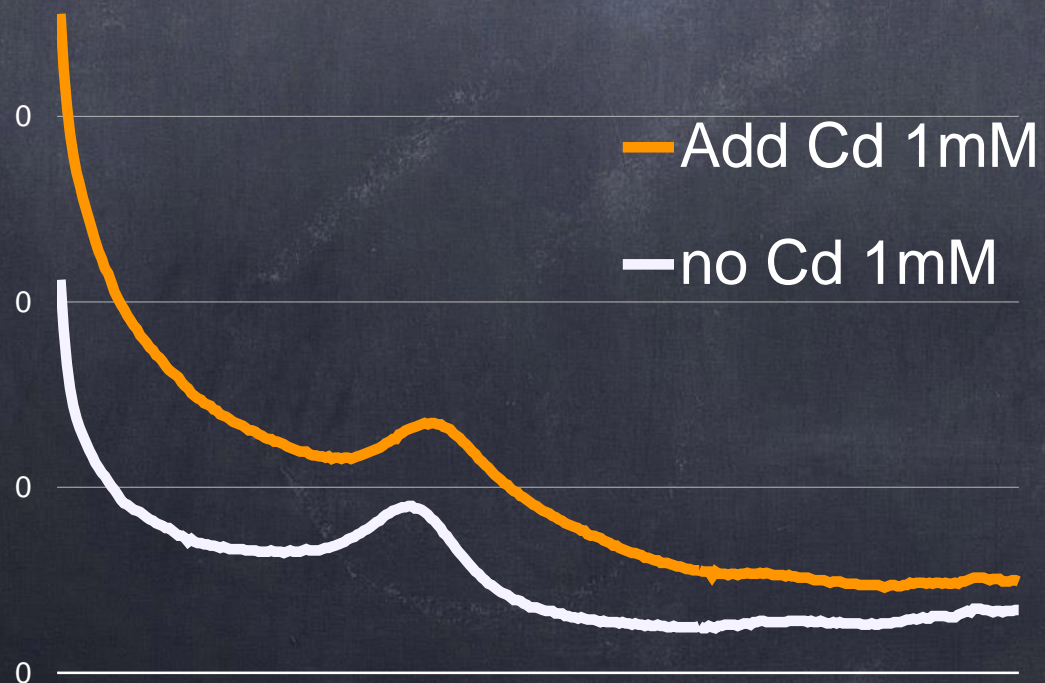
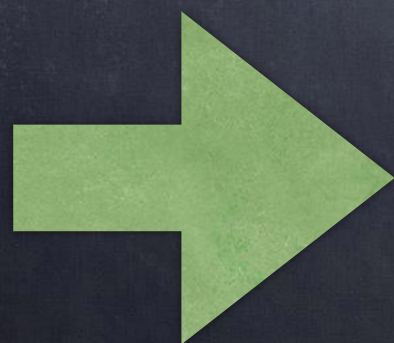


Au-NPs



3nm

13nm(gather)





Human practice

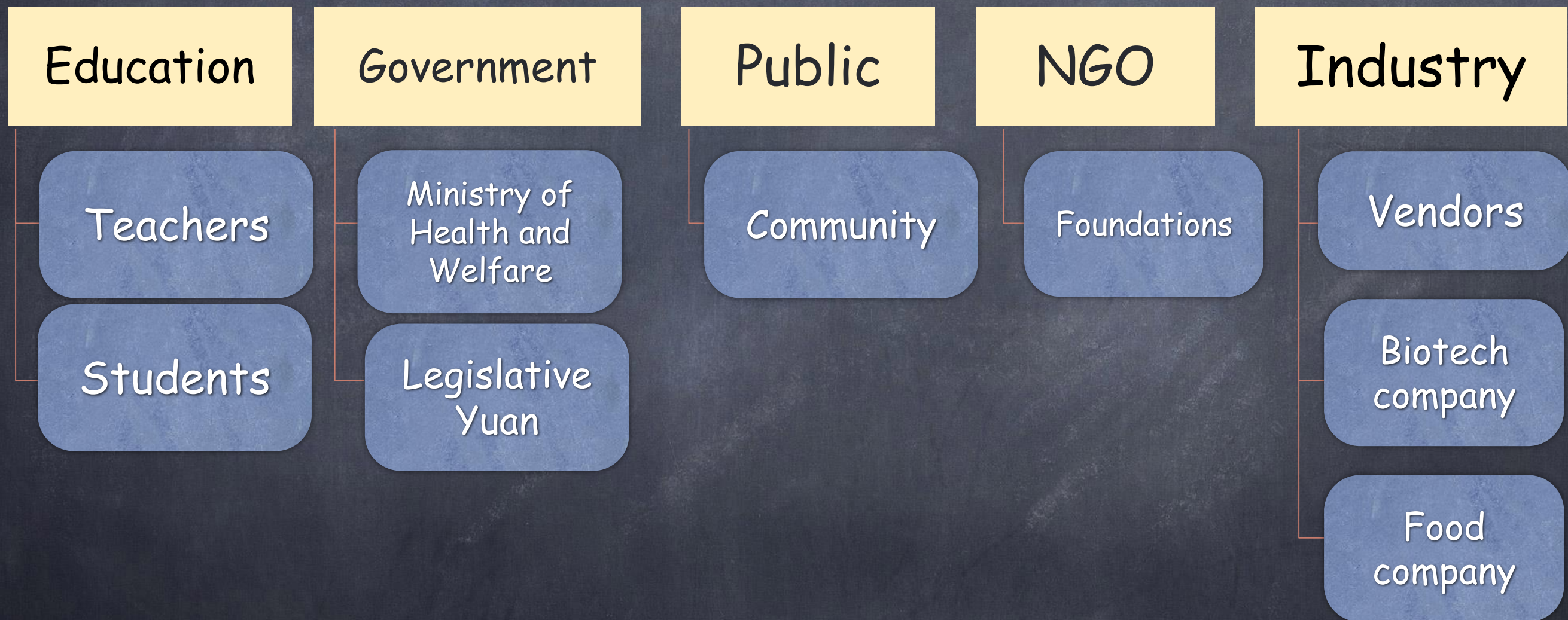


Expected Targets Of Human Practice

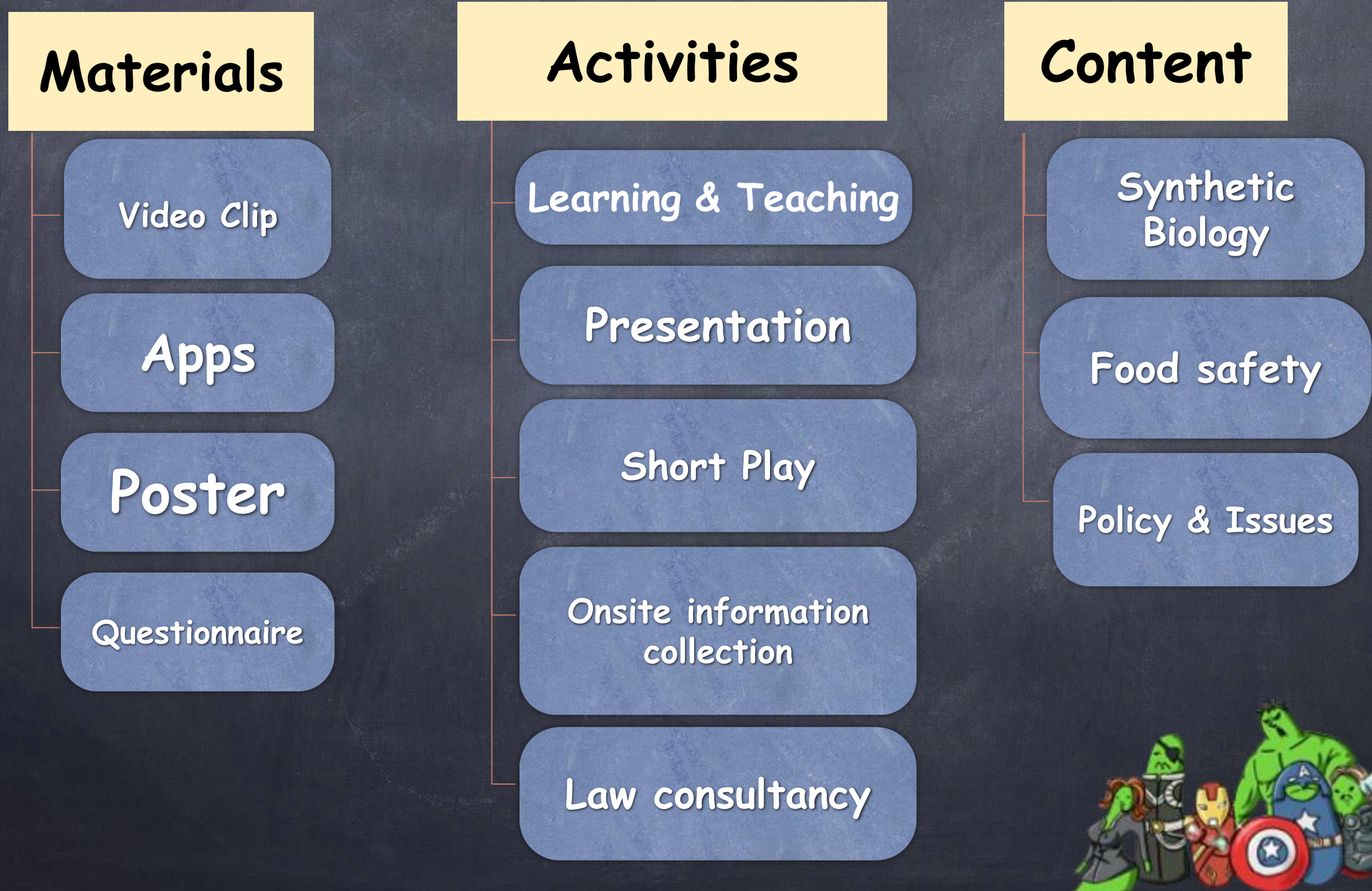
- The bridging of bioscience discovery to the social practice.



Sources Of Human Practice



Sources Of Human Practice



Education

- Every age group should know it.

- Form a league to solve the problem.



Ming Lun
Senior High School
in Taipei



Education



Ming Lun
Senior High School
in Taipei



Xing Long
Elementary
School in Taipei



Kindergarten



Dunman High School
In Singapore



Education



Ming Lun
Senior High School
in Taipei



Xing Long
Elementary
School in Taipei

Dunman High School
In Singapore



Kindergarten



- By playing Apps we made.
- A amazing subject.



Vendor Visits



- Detect the oil by themselves.
- Popularize to each families.
- Maintain the food safety.



Fan Page

- Update the progress
- Information exchange

The genuine Taiwan spirit
is how the society to become
a better place!



Gene Check

Easy

Hard



HSNU-Taipei

Phone Apps



App1 Gene Maker

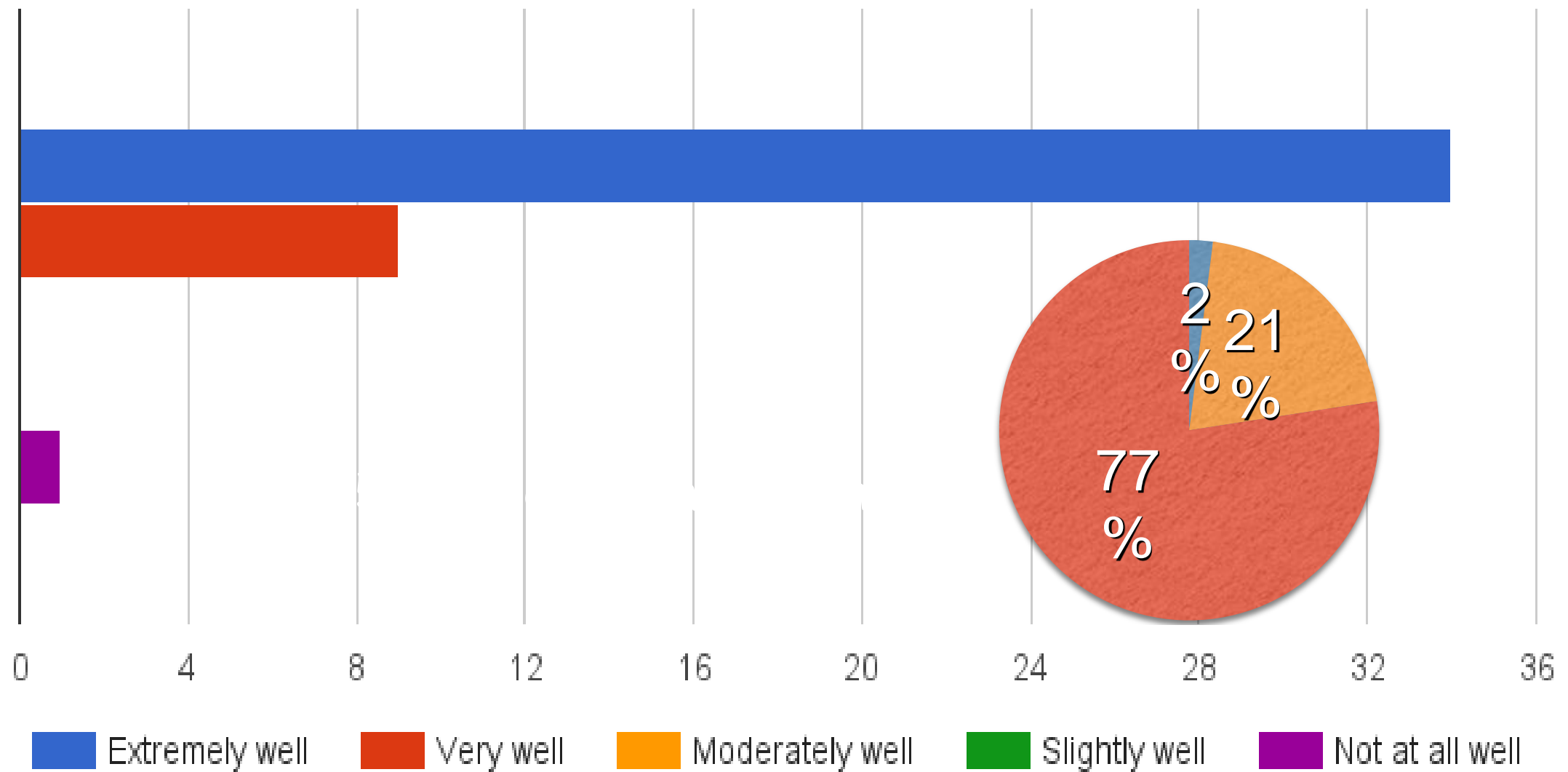


App2 Gene Check

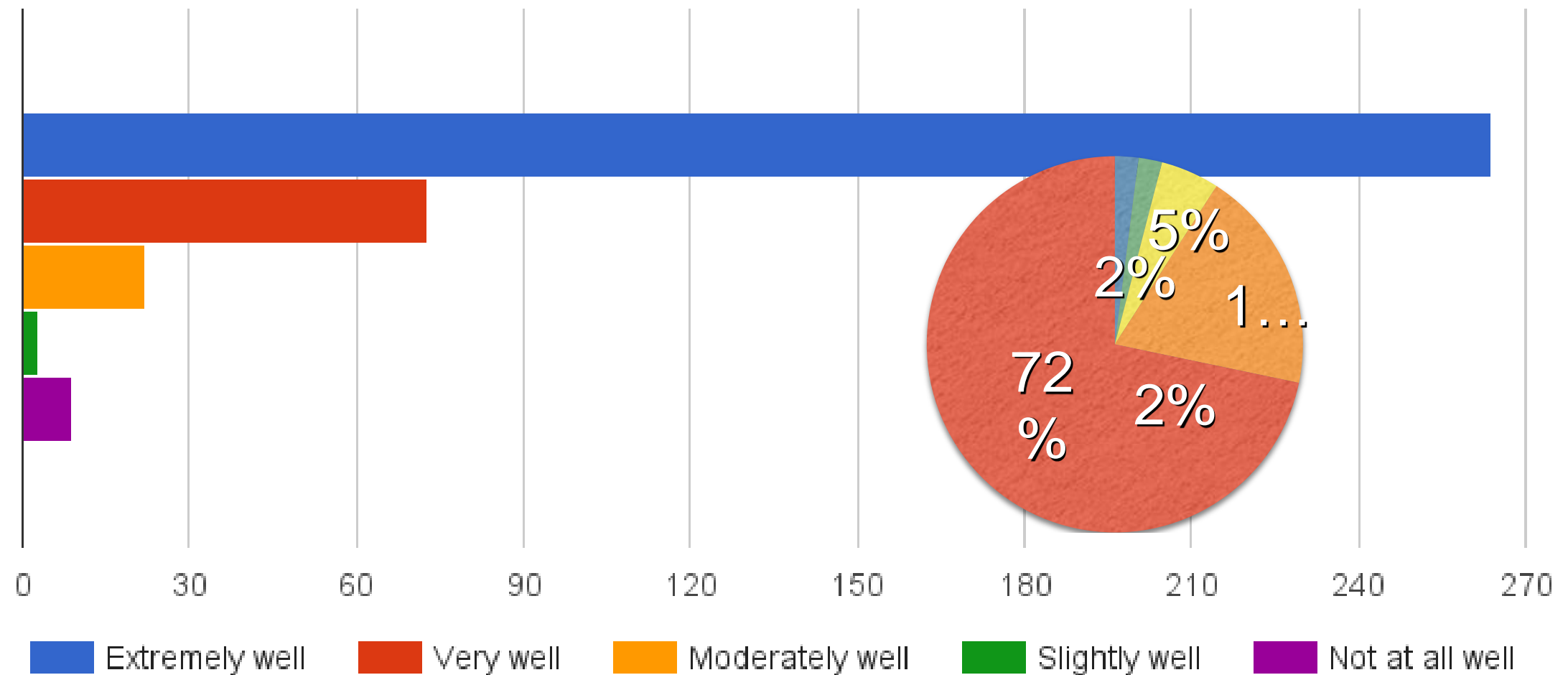




Affirmation percentage



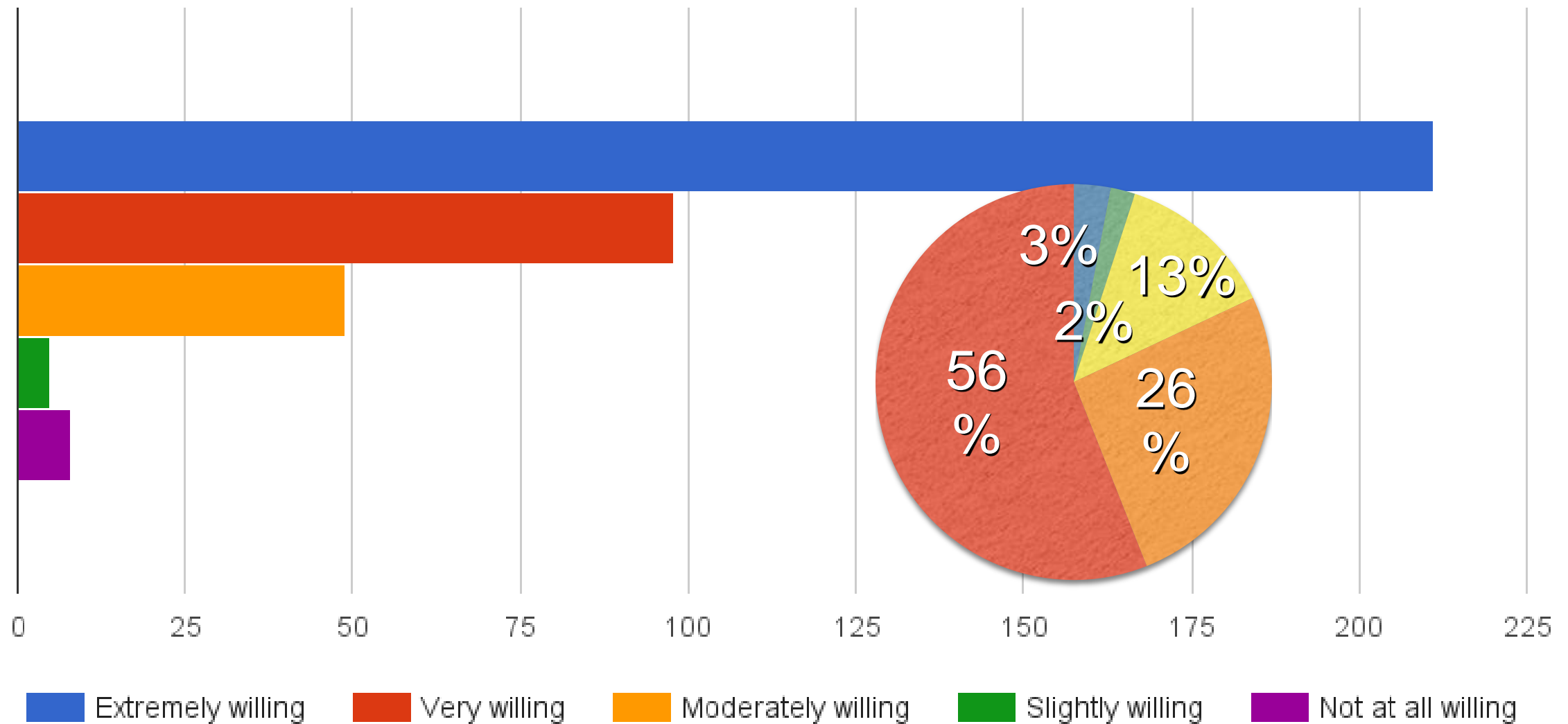
How well do you approve of our experiment?



370 samples



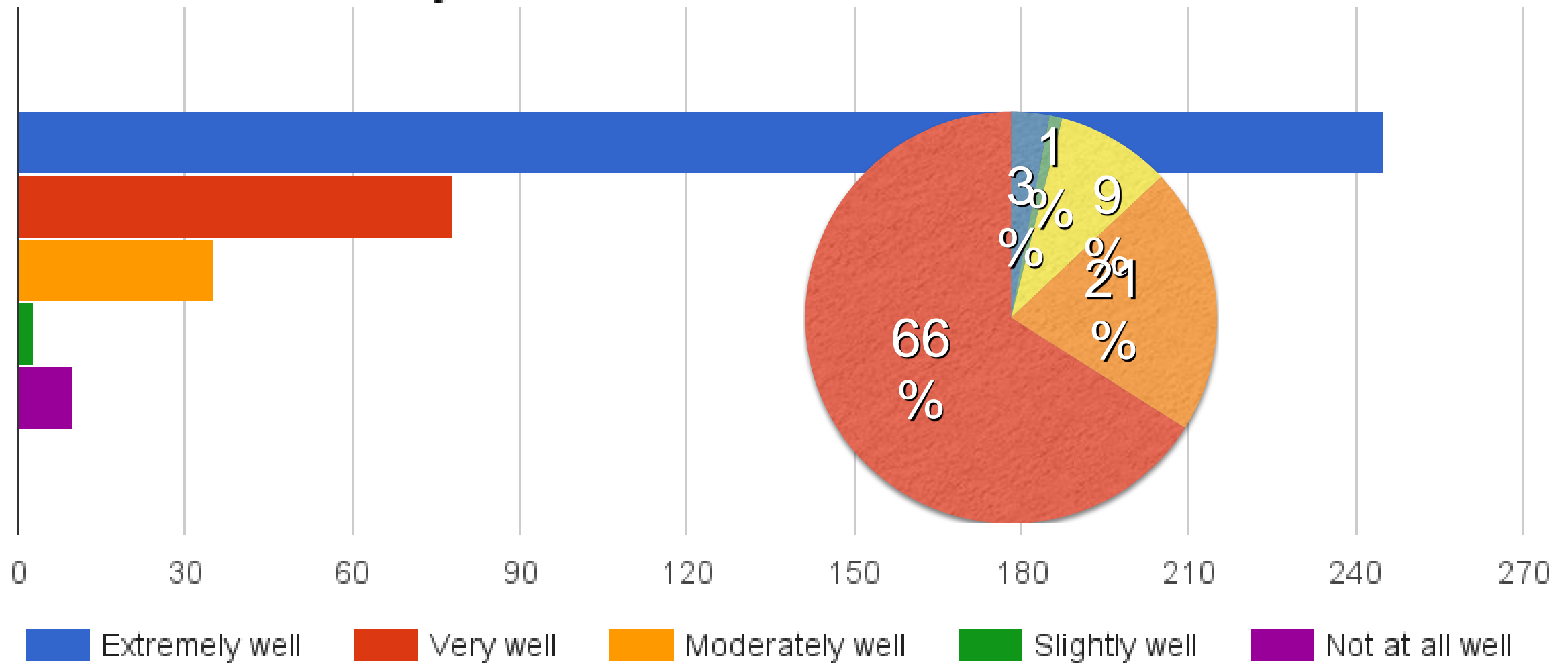
How willing are you to use our self-developed low cost recycled oil detector?



370 samples



How well do you think our project contribute to Taiwan society?



370 samples



Thanks for listening!
We are
HSNU-Taipei, the Evengers

